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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/560,586	12/19/2005	Jean-Yves Laurent	126303	7274

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EXAMINER	
WANG, EUGENIA	
ART UNIT	**PAPER NUMBER**
1745	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/560,586	LAURENT ET AL.	
	Examiner	Art Unit	
	Eugenia Wang	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 15-28 is/are pending in the application.

4a) Of the above claim(s) 25-28 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 15-24 is/are rejected.

7)☒ Claim(s) 15-24 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 12/13/05 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 12/13/05.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. May 4, 2007.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Preliminary Amendment

1. The preliminary filed December 13, 2005 has been acknowledged. Claims 1-14 have been canceled as per Applicant's wishes. Claims 15-28 have been added and are pending.

Election/Restrictions

2. Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 15-24, drawn to fuel cell.

Group II, claim(s) 25-29, drawn to a method of making a fuel cell.

3. The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The special technical feature of Group I is a fuel cell with a circulation means (with a cavity and studs) that makes flow substantially parallel, while the special technical feature of Group II is using ionic etching to form a cavity and studs. Furthermore, the circulation means of Group I does not have to be made using the special technical feature of Group II; for example other methods that can be used include printing or stamping.

4. During a telephone conversation with Kevin Jones on May 4, 2007 a provisional election was made with traverse to prosecute the invention of Group I, claims 15-24. Affirmation of this election must be made by applicant in replying to this Office action. Claims 25-29 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Priority

6. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

7. The information disclosure statement filed December 13, 2005 has been placed in the application file and the information referred to therein has been considered as to the merits with the exception of DE 19835759, which is not in English. Examiner invites applicant to submit a translation for full consideration.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 15-18, and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by US 2001/0036523 (Sobolewski).

As to claim 15, Sobolewski teaches a general fuel cell (fig. 1). The general fuel cell [1] comprises a membrane electrode assembly (MEA) [12] with a polymer electrolyte/ion exchange membrane [14] disposed between two electrode layers or substrates [16A, 16B], where each electrode has a catalyst disposed between the ion exchange membrane and electrode substrate interface on both sides (para 0002). Sobolewski. Furthermore, the substrates of an MEA (porous diffusion substrate) are responsible for delivering reactants to the fuel cells (para 0005). Sobolewski's invention is drawn to a new diffusion substrate that is made of micro-studs that are attached to a base (with the space in between the top of the studs and the base being the cavity) (para 0011). Furthermore the substrates are seen to support the ion exchange membrane [14]. In one embodiment, it is said that the channels formed by the nanorope/nanofiber studs are used to transport reaction constituents (para 0012). (By looking at fig. 2 as a representation, the flow through the channels would be parallel to the surface).

As to claim 16, Sobolewski et al. teaches that the studs are micro-studs made out of nanotubes, nanoropes, and nanofibers (para 0011, lines 8-11; para 0012).

Therefore, the natural measurement for the materials used is nano-scale. Because of the use of nano-scaled material, there would be reasonable expectation that they would be spaced in a manner relative to the size of the materials used (and would thus be less than 50 μm. For example, the spacing of voids [40] the microstuds [32] of fig. 2, although not to scale, gives a representation that the spacing between the studs is nearly the same thickness of the studs. Furthermore, fig. 4 shows studs made of nanoropes [56] made of single walled nanotubes, wherein the voids [62] are smaller than the nanoropes.

As to claim 17, Sobolewski's diffusion substrate [16A, 16B in fig 1] is placed against the ion exchange membrane. As previously stated each electrode has a catalyst disposed between the ion exchange membrane and electrode substrate (aka porous diffusion substrate) interface on both sides (para 0002). Therefore, the diffusion substrate has a plurality of catalytic zones arranged on top of the studs of the cavity, as it can be interpreted (with the broad claim language used) that catalytic zones (from either the anode or cathode catalyst, one of which is considered the first catalytic element) are arranged at the top of the studs.

As to claim 18, Sobolewski's diffusion substrate [16A, 16B in fig 1] is placed against the ion exchange membrane. As previously stated each electrode has a catalyst disposed between the ion exchange membrane and electrode substrate (aka porous diffusion substrate) interface on both sides (para 0002). Therefore, the catalytic zones (from either the anode or cathode catalyst, one of which is considered the first

catalytic element) are formed by the studs, as the studs can be interpreted to define the catalytic zone.

As to claim 20, Sobolewski's studs are circular in cross-section, as can be seen in figs. 2-4.

9. Claims 15 and 17-20 are rejected under 35 U.S.C. 102(e) as being anticipated by US 2003/0232234 (Cisar et al.).

As to claim 15, Cisar et al. teach a fuel cell assembly with substrate (bipolar plate with gas barrier [14] and posts [15]) that supports an electrolyte membrane (labeled PEM in fig. 1), which clearly has two sides (fig. 1). Each PEM has a cathode on one side and an anode on the other side, each of which comprise of their own catalyst layer (para 0006). Cisar et al.'s invention focuses on a bipolar assembly, which has an array of conductive protrusions (posts [15]) disposed across the surface of the gas barrier at spaced apart intervals to form reactant flow fields (para 0011, lines 1-6). (The flow fields formed where the reactant flows is the cavity and the walls formed by posts [15] are the studs.) As the bipolar plate has posts [15] (studs) for reactant flow, it inherently delivers the reactant to the electrodes, and thus the electrode catalytic elements. Furthermore, reactant would inherently cross the flow field in a manner that would be considered parallel towards the surface, as the posts, seen in fig. 5, are ordered perpendicularly and would direct reactant in parallel paths to encounter the least amount of resistance.

As to claim 17, Cisar et al.'s bipolar plate has a plurality of catalytic zones arranged on top of the studs of the cavity. As previously mentioned, an electrolyte

membrane (comprising an anode, an anode catalyst, a cathode, and a cathode catalyst) is place above posts [15] (fig. 1). Therefore, it can be interpreted (as the language of the claim is broad) that catalytic zones (from either the anode or cathode catalyst, one of which is considered the first catalytic element) are arranged at the top of the studs (posts [15]).

As to claim 18, Cisar et al.'s bipolar plate has a plurality of catalytic zones arranged on top of the studs of the cavity. As previously mentioned, an electrolyte membrane (comprising an anode, an anode catalyst, a cathode, and a cathode catalyst) is place above posts [15] (fig. 1). Therefore, the catalytic zones (from either the anode or cathode catalyst, one of which is considered the first catalytic element) are formed by the studs, as the studs can be interpreted to define the catalytic zone.

As to claim 19, Cisar et al. teach that the studs (posts [6]) have a broader zone that forms a head (membrane support [8]).

As to claim 20, Cisar et al.'s studs can be seen to be circular in cross section, shown by the cross sectional views of patterns that the studs can form (fig. 6).

Claim Rejections - 35 USC § 102/103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claim 23 is rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Sobolewski.

The teachings of Sobolewski et al. have been previously discussed and are herein incorporated.

As to claim 23, the bed of studs that Sobolewski teaches seem to be evenly spread in such a manner that would promote distribution of the first fluid (reactant) homogenously.

Alternately, if it is shown that Sobolewski's bed of studs do not form a network that distributes the fluid homogeneously, then such a modification would have been obvious to one of ordinary skill in the art. The motivation of distributing fluid homogeneously is to fully use all areas for the electrochemical reaction, as to produce maximum power. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to arrange the studs in a manner that the first fluid is distributed homogeneously in the cavity.

11. Claims 23 and 24 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Cisar et al..

The teachings of Cisar et al. have been previously discussed and are herein incorporated.

As to claim 23, the network of studs that Cisar et al. teach form a network (fig. 6 shows different shaped networks that Cisar et al. teach). At least some of the networks that can be formed by Cisar et al.'s studs are designed in such a manner that the distribution of the first fluid (reactant) is inherently homogenous. (This especially applies to the ordered hexagonal, diamond, and square patterns shown in fig. 6).

Alternately, if it is shown that Cisar et al.'s network of studs do not form a network that distributes the fluid homogeneously, then such a modification would ahbe veen obvious to one of ordinary skill in the art. The motivation of distributing fluid homogeneously is to fully use all areas for the electrochemical reaction, as to produce maximum power. Therefore it would have been obvious to one having ordinary skill in

the art at the time the claimed invention was made to form a network pattern in such a manner that the first fluid is distributed homogeneously in the cavity.

As to claim 24, Cisar et al. teach two specific embodiments of network patterns that have a zig-zagged shaped: the hexagonal pattern and the diamond pattern (fig. 6).

Claim Rejections - 35 USC § 103

12. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al., as applied to claim 15, in view of US 2004/0224190 (Sasahara et al.).

As to claim 16, Cisar et al. teach a that the distance between the posts are between 1mm to 3 cm (para 0056, lines 5-7).

Cisar et al. do not teach that the distance between the two studs is less than or equal to 50 micrometers.

Sasahara et al. teach a fuel cell with plate that contacts the diffusion layer to deliver reactant to the diffusion layer via supply channel micro channels [33], which are connected to supply channel manifolds [341] (figs 3-4, para 0092). The size of the micro channels [33] (which would be equivalent to how far the studs are apart from each other) ranges from between 20-400 microns (μm) (para 0091, lines 4-6). This range overlaps that of both the instant application and that of Cisar et al., thus indicating that the size of the micro channels are changeable for different needs. The motivation for wanting to make the micro channels smaller (putting the studs closer together) is to be able to the assembly in a smaller fuel cell for portable electronics. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed

invention was made to alter the distance between the studs to that of the instant application in order to be used in a smaller-scaled fuel cell.

Furthermore, it has been held that a change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose,*105 USPQ 237 (CCPA 1955).

13. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al., as applied to claim 15, in view of US 5,840,414 (Bett et al.).

In an alternate interpretation of claim 17, it can be said that Cisar et al. do not teach the fact that the plurality of catalytic zones of the first catalyst are arranged *directly* at the top of the studs of the cavity. (NOTE: This specific language is not in the claim.)

However, Bett et al. teach a fuel cell with catalyst [3] place on top of the ribs [6] of the reactant flow (fig. 1). In this teaching, the ribs [6] serve as the studs, as they direct reactant flow. Therefore, the plurality of catalytic zones are arranged at the top of the studs. The motivation for putting the catalytic zones directly on the studs which serve the equivalent purpose as the "posts" in the Cisar et al.) is to remove the necessity of the gas diffusion layer, which cuts down on material costs of the fuel cell as well as makes the fuel cell smaller. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to put the catalyst directly against the studs in order to miniaturize the fuel cell and in order to cut down on material needs by cutting out the gas diffusion layer.

In an alternate interpretation of claim 18, it can be said that Cisar et al. do not teach the fact that the plurality of catalytic zones of the first catalyst are formed *directly* by the studs. (NOTE: This specific language is not in the claim.)

However, Bett et al. teach a fuel cell with catalyst [3] place on top of the ribs [6] of the reactant flow (fig. 1). In this teaching, the ribs [6] serve as the studs, as they direct reactant flow. Therefore, the plurality of catalytic zones are arranged at the top of the studs in such a manner that the different zones are defined by the ribs. The motivation for putting the catalytic zones directly on the ribs (which serve the equivalent purpose as the "posts" in the Cisar et al.) is to remove the necessity of the gas diffusion layer, which cuts down on material costs of the fuel cell as well as makes the fuel cell smaller. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to put the catalyst directly against the studs in order to miniaturize the fuel cell and in order to cut down on material needs by cutting out the gas diffusion layer.

14. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al., as applied to claim 1, in view of US 2002/0132156 (Ruhl et al.).

(NOTE: In the rejection for claim 20, Cisar et al. teach studs with a circular cross section.)

As to claims 21 and 22, Cisar et al. do not teach studs with a rectangular cross-section (as required by claim 21) or a polygonal cross-section (as required by claim 22).

Ruhl et al. teach the use of squares, rectangles, and other regular or irregular polygonal shapes as column shapes for to regulate gas distribution on electrode [13]

(which has studs, as can be seen in fig. 3) (para 0055). (Although Ruhl et al.'s teaching is to an electrode with studs, it still teaches controlling a flow field with stud shape.) The motivation for using differently shaped studs is to control the flow distribution. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use studs with different cross sections in order to control flow distribution.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eugenia Wang whose telephone number is 571-272-4942. The examiner can normally be reached on 8 - 4:30 Mon. - Fri., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

GREGG CANTELMO
PRIMARY EXAMINER

Gregg Cantelmo 6/13/07
FOR. E. WANG